HVAC: Packaged Single Zone VAV

Description

This proposed prescriptive measure requires variable air volume controls on the supply fans of all packaged air conditioners and heat pumps above a certain size. These controls will only be required on systems with two or more compressors. Typically, these units are seven and a half tons and larger. The requirements of this measure can be met with either 2-speed motors or variable speed drives.

Units up to 20 tons are currently covered by the Energy Policy Act of 1992 (EPACT). Research will determine if the EPACT exemption applies to these proposed controls on units 20 tons and smaller.

Benefits

This off-peak measure will provide significant energy savings. On its own, the measure will not provide demand reduction, but saves energy during part-load conditions by reducing the supply fan speed when the compressors are unloaded.

If implemented, the measure will provide a means for significant load shedding. At half-speed, the supply fan energy should drop by approximately 1/8 of the design kW, and the compressor energy will drop to approximately half of its design kW (or greater depending on the condenser circuiting).

Environmental Impact

This measure will considerably reduce energy use with no significant increase in the consumption of other resources.

Type of Change

This proposal would be a new prescriptive measure. It would require changes in the *Standards*, ACM Manual, the Nonresidential Compliance Manual, and the compliance forms.

Measure Availability and Cost

Trane and Carrier are the principal manufacturers of these products. York and McQuay also manufacture this equipment. All of these manufacturers offer variable speed drives for the supply fans as the standard option on large equipment. On all packaged equipment, the controls that vary the speed of the supply fan have to be interlocked with the controls that stage the compressors to prevent coil freezing and unacceptable supply air temperatures (draft). The best way to accomplish this is through factory-mounted controls, which are warranted by the manufacturers with the equipment. These proposed controls could also be provided through third parties in the field. However, since that may void the manufacturer's warranty on the refrigeration equipment, this issue requires more investigation.

Equipment with these variable speed supply fan controls is currently offered by the major manufacturers in the residential market and has been developed and offered in the commercial market in the past (there has been at least one product line in the five to 10-ton range developed for an ESCO). This change is not significant for the manufacturers since they are already familiar with the components and controls.

This measure's baseline for evaluation is packaged equipment with a constant speed supply fan.

Useful Life, Persistence and Maintenance

The addition of variable speed drives or 2-speed motors will add complexity to the controls, but should not cause additional wear and tear on the supply fan or refrigeration system. The life of a commercial package unit is approximately 15 years.

Performance Verification

No field verification is proposed if the factory installs the controls. If the controls are field-installed, the contractor installing the controls will provide verification during startup.

Cost Effectiveness

This measure is likely to be cost effective.

Cost premiums will be estimated using the incremental costs of the new components and controls, and energy savings will be developed through simulations. Life cycle cost analysis will be completed as a function of both climate and unit size.

Analysis Tools

Standard DOE2-based simulation tools will be used to evaluate this measure.

Relationship to Other Measures

This change should not interact with any other measure.

Bibliography and Other Research

None.